高等院校“十一五”规划教材

English for Applied Engineering of Petroproducts

油品应用工程专业英语

陈波水 姚新学 铉 静
方建华 王 九 编

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内 容 提 要

本书是在精选国外专业文献基础上编写而成的。全书共20课，每课由课文、词汇表、课文注释、练习和阅读材料组成。课文和阅读材料的知识模块主要包括新能源、石油开采与炼制、燃料、润滑油、润滑脂、油品添加剂、固体润滑剂、石油化学品、燃烧学、摩擦学，基本囊括了油品应用工程专业的专业内容。

本书适于具有大学英语水平的读者学习专业英语，可作为高等院校油品应用工程专业的专业英语教材，亦可供其他相近专业选用，还可作为有关工程技术人员的参考书。

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前　言

如果说学习英语主要是为了借鉴国外先进科技知识，为我国的现代化建设服务，那么阅读国外专业科技文献则是达到此目的的最重要、最现实的手段。不少人有这样一种错误认识：只要能读懂英文报刊、小说，阅读专业科技书刊就不成问题。实际上，英文科技书刊有许多与英文报刊、小说不同的特点，仍需要我们去学习和掌握。比如，专业科技书刊就其语言来说被动句多、长句多、专业词汇多等。为了帮助油品应用工程专业的本科生和相关专业的工程技术人员学习专业英语，我们编写了此书。

教材是教学的基本要素之一。本书旨在为油品应用工程专业的专业英语教学提供一本比较系统的教学用书。书中课文和阅读材料均选自英美原版书刊，语言地道，所涉及的专业内容既照顾系统性，也考虑了先进性。通过学习本教材，可以对油品应用工程专业有一个相对全面的了解，包括专业内容、专业动态和文章题材等。

本书课文主要用于课堂教学，阅读材料和练习主要用于课后阅读和作业。教师可根据具体情况，有选择地安排教学。本书虽经多次补充和完善，但限于编者水平，不足之处在所难免，恳请广大师生和读者批评指正。

本书编写过程中始终得到后勤工程学院油品应用工程教研室熊云教授的关怀和帮助。后勤工程学院王蒙、冯静、林诗帆、肖璐薇、姚代勇、孙璐等同志参与部分内容编写和修校，在此一并表示感谢。

编　者

CONTENTS

Lesson 1 Energy

Energy is an essential ingredient of all systems of life, from the simplest single-cell bacterium to the most complex of human communities. The word 'energy' has many meanings, some of these are nebulous—'nervous energy' for example, whilst others are quite precise such as 'kinetic energy', the energy of motion and 'potential energy', the energy of position, both of which are terms used widely in science and engineering. No matter how basic man's existence, two sources of energy are essential. Firstly, food, which contains a chemical form of potential energy, converted by the body into kinetic energy and secondly, shelter from the elements, which in nontemperate climates really means heat or thermal energy. As civilization has developed, demands for energies other than chemical and thermal have increased especially where tasks must be undertaken involving forces normally beyond man's modest abilities. This is particularly true of mechanical energy which is obtained by conversion from some other form of energy since energy like mass is neither created nor destroyed. The usual energy source is of course chemical energy in a fuel. The combustion of fuels thus releasing energy as heat, which can then be converted to mechanical energy, is always accompanied by an exhaust stream, which is usually polluting and undesirable. This, coupled with the need to transmit energy over long distances, has led to the development and utilization of electrical energy, which is probably the most convenient form of energy in modern civilization.

Thus, four important forms of energy are basic to man's well-being—chemical, thermal, mechanical and electrical energy.

It has already been seen how chemical energy in the form of food is converted within the body to thermal and particularly mechanical or kinetic energy. Thus food can be considered as a fuel, a general term for those materials with a structure such that they contain chemical energy which can be converted into a useful form, usually thermal energy. This conversion process is termed combustion and in this sense the conversion of food within the body is a slow combustion process. Using the general definition of a fuel, almost anything which combines with oxygen in an exothermic reaction may be included, although it is necessary to be rather more specific since the heat must be released at an acceptable and preferably controllable rate. In the main, most fuels contain carbon and usually hydrogen, which are converted to carbon dioxide and water, and the normal definition of a fuel refers to fossil fuels, that is, those fuels which occur naturally in the earth's crust. Thus, the main fossil fuels are coal, crude petroleum, and natural gas and all derived or secondary fuels emanated from these.

So far the discussion has been limited to fuels which release energy, usually thermal, by means of a chemical reaction involving a rearrangement of the outer electrons of the atom only, leaving the nucleus unaffected. There are, however, several fuels in which the nucleus can be disturbed by bombardment with high energy subatomic particles and such fuels are termed nuclear fuels, the energy conversion taking place by forces many thousands of times greater than ordinary chemical

forces, the energy released is correspondingly greater. It has been estimated, for example, that the energy released by the fission of all the nuclei in one kilograms of the 235 mass number isotope of Uranium is equivalent to the chemical energy released by the combustion of 500 000 kg of coal.

In essence, then, there are four major forms of energy, chemical, thermal, mechanical and electrical, of which thermal and electrical are probably the most convenient and these are produced by conversion from chemical energy which is contained in chemical and nuclear fuels. Chemical fuels may be subdivided into primary fuels, those which are derived from the Earth's crust by physical processes only, and secondary fuels, which involve a chemical reaction at some stage of their manufacture.

Much of the largest proportion of all energy on and in the earth has been and is derived from the sun. This solar energy takes two forms: the daily input which manifests itself in solar radiation, the winds and waves and hydropower; and the energy which has come from the sun since the formation of the earth which is stored in the earth's crust primarily as fossil and nuclear fuels together with geothermal energy and vegetation. This may be thought of as capital energy. Primitive man drew only slightly on this capital wealth, the burning of wood and so on, though as the general demands of civilization developed, man's energy requirements escalated such that capital wealth has rapidly diminished and indeed is today in danger of depletion.

It has been seen that fuels supplied are limited and for the most part exhaustible and that the technologies for handling long-term energy sources require extensive development. It is certain that oil reserves will decrease rapidly, given the present rate of consumption and there will be a natural diversification to other energy sources as a result of ever increasing oil prices. Because of the greater reserves, coal is likely to be re-established as the dominant fossil fuel and nuclear energy will obviously play a greater role, though it is vital that breeder reactors become commonplace if this is to be a long-term benefit. The same reasoning applies to thermonuclear fusion if this can be made to work. Even if these alternative energy sources are exploited, the supplies of fossil fuels are still limited and it is important that they should be conserved, by reducing waste and the substitution of other sources of energy over an extended period, for use in their proper place—as a feedstock for the chemical industries.

New words and expressions

ingredient /in'gri:diənt/ *n.* 组成部分，要素
bacterium /bæk'tiəriəm/ *n.* 细菌
nebulous /'nebjuləs/ *adj.* 模糊的，朦胧的
nervous /'nə:vəs/ *adj.* 神经质的，有力的
kinetic /ki'netik/ *adj.* 运动的，动力的
combustion /kəm'bʌstʃən/ *n.* 燃烧
non-temperate *adj.* 不温和的，不适合的
~ Climate 寒带气候
fossil /'fɔsl/ *n.* 化石，矿物
emanate /'əməneit/ *v.* 放出，发出
fission /'fiʃən/ *n.* 裂变，分裂
isotope /'aisəutəup/ *n.* 同位素

uranium /juə'reiniəm/ *n.* 铀
subdivide /'sʌbdi'vaid/ *v.* 再分，细分
radiation /ˌreidi'eiʃən/ *n.* 辐射，照射
geothermal /ˌdʒi(:)əu'θəməl/ *adj.* 地热的
escalate /'eskəleit/ *v.* 逐步上升，提高
diminish /di'miniʃ/ *v.* 减少，缩小，递减
subatomic /'sʌbə'tɔmik/ *adj.* 亚原子的，比原子更小的
breeder /'bri:də/ *n.* 增殖堆
~ reactor 增殖反应堆
fusion /'fju:ʒən/ *n.* 核聚变
exploit /iks'plɔit/ *vt.* 开发利用
feedstock /fi:dstɔk/ *n.* 原料
depletion /di'pli:ʃən/ *n.* 耗尽，损耗

Notes to the Text

1. . . . converted by the body into kinetic energy.
由身体将其转化为动能。
此短语作为定语修饰 a chemical form of potential energy。
2. . . . shelter from the elements, . . .
躲避各种自然力之处。
element 作单数解为“要素、成分”等，作复数解为“自然力、风雨”等。
3. . . . demands for energies other than chemical and thermal have increased especially where tasks must be undertaken involving forces normally beyond man's modest abilities . . .
人们对化学能和热能以外其他能量的需要增加了，尤其在承担的任务超出人类有限的能力时。
other than 意为“除了”，如：
a. All parts of the house other than the windows were in good condition.
除了窗子外，屋子的其他部分都很好。
b. There's nobody here other than me.
这里除了我，没有其他人。
4. This is particularly true of mechanical energy . . .
机械能的情况更是如此……
be true of 意为“符合于……”，“对……适用”。
如：The same is true of all other cases. 对于其他各例而言，也是如此。
5. Thus food can be considered as a fuel, a general term for those materials with a structure such that they contain chemical energy . . .
因此，食物可以被视为一种燃料。这里的燃料是个一般术语，指那些结构含有化学能的材料。
本句中 a general term 是 a fuel 的同位语，such that，意为“如此，即……”。如：
The direction of induced current is such that it will oppose the original current.
感应电流的方向与原电流的方向相反。
6. Using the general definition of a fuel, almost anything which combines with oxygen in an exothermic reaction may be included, . . .
如果使用燃料的一般定义，几乎所有能在放热反应中与氧结合的物质都可以算作燃料。
using the general definition of a fuel 是一分词短语，表示条件，通常可译成“如果……”，“假若……”，“只要……”，“一旦……就……”等，如：
a. Looking at the lift formula, you can see that lift and drag vary directly with the density of air.
只要看一看升力公式，就可以了解升力和阻力与空气密度成正比。
b. Using a transformer, power at low voltage can be transformed into power at high voltage.
如果使用变压器，低电压电力就能转换成高电压电力。

7. . . . forces many thousands of times greater than ordinary chemical forces . . .
比普通化学力大几千倍的力……

Exercises

Ⅰ. Fill in the blanks with the following words and change them into the appropriate forms if it is necessary.

diminish exploit feedstock convenient disturb
dominant commonplace contain undertake involve

1. Some scientists believe that soon it will be _____ for people to travel to the moon.
2. This new technology has _____ the cost of production.
3. The topic under discussion is to _____ oil under the sea.
4. All the children were _____ in the school play.
5. The speech given last Monday _____ lots of interesting ideas.
6. I _____ to help the people rebuild their homeland in the earthquake-stricken areas.
7. The host was quite annoyed when he found out that his things on the bookshelves had been _____ .
8. The right hand is _____ in most people.
9. All machines require _____ to be operated on.
10. I'd like to buy an apartment that is _____ to shopping and transportation.

Ⅱ. Reading Comprehension.

1. Which of the following does NOT belong to the category of fossil fuel?
   A. Coal. B. Food. C. Crude petroleum. D. Natural gas.
2. From where is much energy derived?
   A. The sun. B. Fossil and nuclear fuels.
   C. The burning of wood. D. Oil reserves on the earth.
3. How did primitive man make use of capital energy?
   A. They made great use of capital energy in their daily lives.
   B. Capital wealth has been completely diminished.
   C. Primitive man drew only slightly on this capital wealth.
   D. They are in danger of depletion.
4. Why is coal likely to be re-established as the dominant fossil fuel?
   A. Because coal is cheaper compared to other energies.
   B. Because of its greater reserves.
   C. Because it can be found at convenient places and easy to transport.
   D. Because it is a better alternative energy.
5. According to the passage, what is the current situation of energy?
   A. It has been seen that fuels supplied are abundant.
   B. For the most part, energy is inexhaustible.
   C. The technologies for handling long-term energy sources have been extensively developed.
   D. Oil reserves will decrease rapidly towards the end of the present century.

Ⅲ. Translate the following English into Chinese.

1. As civilization has developed, demands for energies other than chemical and thermal have increased especially where tasks must be undertaken involving forces normally beyond man's modest abilities.
2. It has already been seen how chemical energy in the form of food is converted within the body to thermal and particularly mechanical or kinetic energy.

3. Much of the largest proportion of all energy on and in the earth has been and is derived from the sun.
4. It is certain that oil reserves will decrease rapidly towards the end of the present century, given the present rate of consumption and there will be a natural diversification to other energy sources as a result of ever increasing oil prices.
5. Even if these alternative energy sources are exploited, the supplies of fossil fuels are still limited and it is important that they should be conserved, by reducing waste and the substitution of other sources of energy over an extended period, for use in their proper place—as a feedstock for the chemical industries.

Ⅳ. Answer the following questions.

1. What are the two terms used widely in science and engineering?
2. The author lists two essential sources of energy, what are they?
3. What are the four important forms of energy which are basic to man's well-being?
4. What does "This conversion process" in paragraph 3 refer to?
5. What are the main fossil fuels?

Reading Material

Alternative Fuel

Alternative fuels, also known as non-conventional fuels, are any materials or substances that can be used as a fuel, other than conventional fuels. Conventional fuels include: fossil fuels (petroleum, coal, propane, and natural gas, etc.), and also in some instances nuclear materials such as uranium. Some well known alternative fuels include biodiesel, ethanol, butanol, chemically stored electricity (batteries and fuel cells), hydrogen, methane, natural gas, vegetable oil, and biomass.

Almost all fuels are chemical fuels that store chemical potential energy. The end user is then able to consume the fuel at will, and release energy, usually in the form of heat for a variety of applications, such as powering an engine, or heating a building.

In the year 2000, there were about eight million vehicles around the world that ran on alternative fuels, indicating an increasing popularity of alternative fuels. There is growing social interest, and a perceived economic and political need for the development of alternative fuel sources. This is due to general environmental, economic, and geopolitical concerns of sustainability.

The major environmental concern is that 'Most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations'. Since burning fossil fuels are known to increase greenhouse gas concentrations in the atmosphere, they are a likely contributor to global warming. Another concern is the 'peak oil theory', which predicts a rising cost of oil derived fuels caused by severe shortages of oil during an era of growing energy consumption. According to the theory, the demand for oil will exceed supply and this gap will continue to grow, which could cause a growing energy crisis starting between 2010 and 2020. Lastly, the majority of the known petroleum reserves are located in the middle east. There is general concern that worldwide fuel shortages could intensify the unrest that exists in the region, leading to further conflict and war.

The production of alternative fuels can have widespread effects. For example, the production of corn-based ethanol has created an increased demand for the feed stock, causing rising prices in almost everything made from corn. However, in a competitive free market, an increased supply of ethanol reduces the demand for conventional fuels, and thus lowers fuel prices. The ethanol indus-

try enables agricultural surpluses to be used to mitigate fuel shortages.

Most alternative fuels assume a source of renewable energy or at least sustainable energy as a source of the fuel. A few alternative fuels (for example, hydrogen) may be made by sustainable or non-sustainable means. If they are made by non-sustainable means, such fuels are offered as alternatives usually because they offer to cause less pollution at the point of use, and perhaps less pollution overall.

Fig. 1 Switchgrass, a hardy plant used in the biofuel industry in the United States

Biomass, in the energy production industry, refers to living and recently dead biological material which can be used as fuel or for industrial production. Most commonly, biomass refers to plant matter grown for use as biofuel, but it also includes plant or animal matter used for production of fibres, chemicals or heat. For example, switchgrass, a hardy plant as shown in Fig. 1, has been used in the biofuel industry in the United States. Biomass may also include biodegradable wastes that can be burnt as fuel. It excludes organic material which has been transformed by geological processes into substances such as coal or petroleum. There are very large quantities of unused biomass which can be obtained economically and used in place of coal and petroleum.

Non-conventional oil is a fossil fuel chemically identical and with the same origin as conventional or traditional oil, but existing in a different form. They often contain more contaminants and are more energy intensive to produce, thus raising environmental concerns about the sustainability of these fuels. Non-conventional oil sources include tar sands, oil shale and bitumen. Non-conventional oil production is currently less energy-efficient, and has a larger environmental impact than conventional oil production.

Methanol from any source can be used in internal combustion engines with minor modifications. It usually is made from natural gas, sometimes from coal, and could be made from any carbon source including CO_2. Flexible fuel vehicles may run with a high percentage of ethanol (up to 85% ethanol plus 15% gasoline for cold-starting vapor pressure).

Methanol and ethanol are typically not primary sources of energy; however, they are a convenient way to store the energy for transportation. No type of fuel production is 100% energy-efficient, thus some energy is always lost in the conversion. This energy can be supplied by the original source, or from other sources like fossil fuel reserves, or solar radiation, or hydro, wind or nuclear energy. The use of energy to produce alcohol fuels could potentially proceed via production of hydrogen by electrolysis of water, or possibly (in the case of heat from nuclear energy) by the sulfur-iodine cycle; then use of the hydrogen in the Fischer-Tropsch process along with CO_2 from another source. Such a process might store and use hydrogen more efficiently than attempting to use hydrogen directly as fuel (a gallon of alcohol contains about 50% more hydrogen by weight than a gallon

of liquid hydrogen). Since such a process would not liberate net quantities of new CO_2 at the point of combustion, it would be greenhouse neutral, similar to alcohols made from biomass.

New words and expressions

alternative fuel 代用燃料，替代燃料
uranium /juə'reiniəm/ *n.* 铀
fuel cell 燃料电池
sustainability /sə,steinə'biləti/ *n.* 可持续性
anthropo- /'ænθrəupəu/ [前缀]人，人类
anthropogenic greenhouse gas 人造温室气体
intensify /in'tensifai/ *vt.* 加强
surplus /'sə:pləs/ *n.* 剩余，过剩
mitigate /'mitigeit/ *v.* 减轻
geopolitical /,dʒi(:)əupə'litikəl/ *adj.* 地缘政治学的
switchgrass /'switʃgrɑ:s; -græs/ *n.* [植]柳枝稷
identical /ai'dentikəl/ *adj.* 同一的，同样的
contaminant /kən'tæminənt/ *n.* 致污物，污染物
intensive /in'tensiv/ *adj.* 强烈的，精深的
cold-starting 冷起动
conversion /kən'və:ʃən/ *n.* 变换，转化
proceed /prə'si:d/ *vi.* 进行，发生
electrolysis /ilek'trɔlisis/ *n.* 电解
attempt /ə'tempt/ *vt.* 尝试，企图
liberate /'libəreit/ *v.* 释放

Exercises

Directions: you will have 15 minutes to go over the passage quickly and answer the following questions.

For questions 1 – 7, mark

Y (for YES) if the statement agrees with the information given in the passage;

N (for NO) if the statement contradicts the information given in the passage;

NG (for NOT GIVEN) if the information is not given in the passage.

For questions 8 – 10, complete the sentences with the information given in the passage.

1. Nuclear materials such as uranium are alternative fuels.
2. A growing social interest and a perceived economic and political need for the development of alternative fuel sources is due to general environmental, economic, and geopolitical concerns of sustainability.
3. The fact that the demand for oil will exceed supply and this gap will continue to grow could cause a growing energy crisis starting between 2000 and 2010.
4. Only a few alternative fuels assume a source of renewable energy or at least sustainable energy as a source of the fuel.
5. Non-conventional oil often contains more contaminants and are more energy intensive to produce.
6. Oil reserves have decreased in the past decade.
7. Methanol and ethanol are a convenient way to store the energy for transportation.
8. Since burning fossil fuels are known to increase _____ in the atmosphere, they are a likely contributor to global warming.
9. The production of corn-based ethanol has created _____ for the feed stock, causing rising prices in almost everything made from corn.
10. There are very large quantities of unused biomass which can be obtained economically and used in place of _____.

Lesson 2 Petroleum

Petroleum deposits have been known since antiquity and have been studied for at least two centuries. The word 'petroleum' appears to have been used with some frequency by Agricola as early as 1546, and from that time it has been scattered throughout the scientific literature. The first use of petroleum as a heating or lighting material is difficult to determine; most of the evidence on the early use of petroleum concerns bitumen or asphalt because, unlike the lower boiling fractions (oils and naphthas), the bitumens and asphalts do not evaporate and 'disappear' with time. It is not surprising, therefore, that historical documents contain many references alluding to the use of bitumen or asphalt by early civilizations.

Petroleum is liberally scattered throughout the earth's crust, which is divided into natural groups on strata, categorized in order of their antiquity. These divisions are recognized by the distinctive systems of organic debris (as well as fossils, minerals, and other characteristics), and these systems form a chronological time chart that indicates the relative ages of the earth's strata. It is generally acknowledged that petroleum occurs in all of these geological strata from the Precambrian to the recent, and the origin of petroleum within these formations is a question that is still open to conjecture and remains the basis for much research.

Petroleum has been defined in many ways, but it can be regarded fairly broadly as a gaseous, liquid, or solid mixture of hydrocarbon and/or hydrocarbon derivative that occur naturally in the earth. Gaseous petroleum is composed of the lighter hydrocarbons, of which the most abundant is methane (CH_4), more commonly referred to as natural gas. Liquid petroleum consists of the liquid hydrocarbons but also contains varying proportions of dissolved gases, waxes (solid hydrocarbons), and bituminous materials. Liquid petroleum is more commonly called crude oil. Solid and semisolid petroleum consists of the heavier hydrocarbons and bituminous materials and has been referred to variously as bitumen or asphalt.

Above all, petroleum is not a uniform material. In fact, its compositions can vary not only with the location and age of the oil field but also with the depth of the individual well. Indeed, two adjacent wells may produce petroleum with markedly different characteristics. On a molecular basis, petroleum is a complex mixture of hydrocarbons plus organic compounds of sulfur, oxygen, and nitrogen, as well as compounds containing metallic constituents, particularly vanadium, nickel, iron and copper. The hydrocarbon content may be as high as 97%, as, for example, in the lighter paraffinic petroleums, or as low as 50% or less as illustrated by the heavier asphaltic crude oils. Nevertheless, crude oils with as little as 50% hydrocarbon components are still assumed to remain most of the essential characteristics of the hydrocarbons since the nonhydrocarbon portion of the crude oils may actually consist of molecules containing one or, perhaps, two atoms of elements other than carbon and hydrogen.

Crude oils are often classified into asphalt-base, paraffin-base, and mixed-base, depending on

whether they contain asphalt, wax or a mixture of both in the distillation residue. The refiner often classifies crude oils into lubricating and nonlubricating crude oils. All crude oils can be converted into fuels, but not all of them are satisfactory for lubricating oil production. Paraffin-base and mixed-base crudes of lubricating-oil types are usually satisfactory for manufacturing lubricating oils which change comparatively little in viscosity with changes in temperature. Asphalt-base oils show the greatest change in viscosity with temperature changes. However, this differentiation among the types of crude oils used in the manufacture of various products is not rigid. Whatever the type, the nature of products depends materially on the processing methods used in the refinery. Mixtures of crudes are sometimes used to produce products of improved performance characteristics.

Petroleum is the cheapest but not the only possible source of liquid fuels. Petroleum substitutes can be obtained from tar sands, large beds of which have been found in western Canada, and by extraction from coal and from oil shale deposits, which are extensive in Colorado and other Rocky Mountain states. Shale deposits in the United States are said to contain at least 500 billion bbl of shale oil. Many of these deposits contain from 20 to 150 gal of oil per ton of shale. Processes are available to recover the oil from the shale but at a cost today which generally speaking is higher than the cost of producing petroleum from wells.

The world reserves of petroleum are huge but still unknown because vast territories which might contain oil are as yet unexplored. Even in the United States, which produced considerably more than one-half of the oil consumed by the world for many decades, new fields are being discovered and the oil reserves continue to increase. For the last 25 years, new petroleum discoveries in the United States have been sufficient to maintain fairly constant the ratio of our known oil reserves to the volume of oil recovered each year, notwithstanding a tremendous increase in the consumption of petroleum products in these years. Though the oil reserves of the world still appear inexhaustible, the time may come when they will begin to decline.

The petroleum industry, born 100 years ago in western Pennsylvania, has become indispensable to our mechanized civilization of today; its products power and lubricate the machinery of modern industry. We drive our automobiles, fueled with petroleum, on tyres of synthetic rubber made from materials derived from crude oil and natural gas. We ride over smooth highways surfaced with asphalt manufactured from petroleum. We dress in synthetic fabrics, the base of some of which is petroleum or natural gas. We live in homes roofed with petroleum asphalt. We use cosmetics, perfumes, and pharmaceutical products, the bases of which may be petroleum, supplied in attractive dispenser made from plastics, the raw material for which may come from petroleum. Even the food brought into our kitchens is protected by petroleum-wax-impregnated wrappings or boxes. Petroleum is our man of all work!

New words and expressions

antiquity /æn'tikwiti/ *n.* 古代
of ~古的
bitumen /'bitjumin/ *n.* 柏油，沥青
fraction /'frækʃən/ *n.* 馏分
allude /ə'lju:d/ *vi.* 提到，引证
be alluded to as ... 称作……

Lesson 2 Petroleum

liberally /'libərəli/ *adv.* 丰富地，充足地
strata /'streitə/ *n.* 地层，岩层
单数形式为 stratum
oil bearing stratum 地下油层
debris /'debri:, 'deib-/ *n.* 腐质，有机物残渣
fossil /'fɔsl/ *n.* 化石
conjecture /kən'dʒektʃə/ *n.* 推测，假设
form (take) ~upon 推测
indispensable /ˌindis'pensəbl/ *adj.* 不可缺少的，必需的
pharmaceutical /ˌfɑ:mə'sju:tikəl/ *adj.* 药品的，医药的
chronological /ˌkrɔnə'lɔdʒikəl/ *adj.* 按年代先后的，编年的
derivative /di'rivətiv/ *n.* 衍生物
vanadium /və'neidiəm, -djəm/ *n.* 钒
territory /'teritəri/ *n.* 地区，领域，领土
fabric /'fæbrik/ *n.* 织品，纤维品
cosmetic /kɔz'metik/ *n.* 化妆品
perfume /'pə:fju:m/ *n.* 香水，香料
dispenser /dis'pensə/ *n.* 配量器，药剂师
impregnate /'impregneit/ *v.* 浸入，注入
~timescale 地层时序表

Notes to the Text

1. The word "petroleum" appears to have been used with some frequency by Agricola as early as 1546.
"石油"这个词似乎早在 1546 年就已被阿格里科拉多次使用过。
to have been used 是不定式完成式，表示行为发生在句中谓语动词 appear 表示的行为之前。此类例子有：
   a. If a body moves from one position to another, it is said to have had displacement.
   如果物体从一个位置向另一个位置移动，我们就说这个物体已有了位移。
   b. This machine is said to have been tested.
   据说已经对这台机器进行了试验。
2. most of the evidence on the early use of petroleum concerns bitumen or asphalt...
大部分证据表明，石油的早期使用限于沥青或柏油。
3. and the origin of petroleum within these formations is a question that is still open to conjecture...
石油在这些地层内的起源问题仍处于推测阶段。
4. Processes are available to recover the oil from the shale but at a cost today which generally speaking is higher than the cost of producing petroleum from wells.
从页岩中获取油的工艺是可行的，但目前的代价一般高于从油井采油。

Exercises

Ⅰ. Fill in the blanks with the following words and change them into the appropriate forms if it is necessary.

conjecture assume constituent available fossil
classify territory pharmaceutical recover adjacent

1. I _____ you always get up at the same time.
2. Coal is a _____ fuel.
3. The rumor raised much _____ .
4. Wild animals will not allow other animals to enter their _____ .
5. He changed his major from _____ chemistry to pharmaceutical botany.
6. Both the city and its _____ suburbs are suffering from storm.
7. Do you know the _____ parts of an atom?
8. Chinese commodities _____ for export are varied.
9. She soon _____ herself and stopped crying.

10. Books in libraries are usually _____ by subjects.

Ⅱ. Reading Comprehension.

1. What is the origin of petroleum?
   A. It originates from water.
   B. It starts from solids.
   C. It is generally acknowledged that petroleum occurs in all of the earth strata.
   D. It is a question that is still open to conjecture.
2. Why can two adjacent wells produce petroleum with significantly different characteristics?
   A. Because their locations are different.
   B. Because ages of the oil field are different.
   C. Because the depth of each individual well is different.
   D. None of the above.
3. It has been found that all crude oils _____ .
   A. can be converted into fuels
   B. is satisfactory for lubricating oil production
   C. change comparatively much in viscosity with changes in temperature
   D. both A and B
4. What are sometimes used to produce petroleum products of improved performance?
   A. Asphalt-base oils.
   B. Wax.
   C. Refined oils.
   D. Mixtures of crudes.
5. Which of the following is true about fuel production?
   A. Petroleum is the only possible source of liquid fuels.
   B. Petroleum substitutes can be obtained from oil shale deposits.
   C. Processes to recover the oil from the shale is cheaper than petroleum production from wells.
   D. Petroleum can be made from tar sands.

Ⅲ. Translate the following English into Chinese.

1. Petroleum is liberally scattered throughout the earth's crust, which is divided into natural groups on strata, categorized in order of their antiquity.
2. Above all, petroleum is not a uniform material. In fact, its compositions can vary not only with the location and age of the oil field but also with the depth of the individual well.
3. However, this differentiation among the types of crude oils used in the manufacture of various products is not rigid.
4. Though the oil reserves of the world still appear inexhaustible, the time may come when they will begin to decline.
5. The petroleum industry, born 100 years ago in western Pennsylvania, has become indispensable to our mechanized civilization of today; its products power and lubricate the machinery of modern industry.

Ⅳ. Answer the following questions.

1. Who was the first person to use the word 'petroleum'?
2. The author lists three groups of petroleum, i. e. gaseous petroleum, liquid petroleum, solid and semisolid petroleum. Can you describe their respective formation?
3. Where can we obtain petroleum substitutes?
4. Do we know surely the world reserves of petroleum? If we don't, why?
5. What uses of the petroleum does the author list?

Reading Material

Hydrocarbon and Petroleum

In organic chemistry, a hydrocarbon is an organic compound consisting entirely of hydrogen and carbon. With relation to chemical terminology, aromatic hydrocarbons or arenes, alkanes, alkenes and alkyne-based compounds composed entirely of carbon or hydrogen are referred to as 'pure' hydrocarbons, whereas other hydrocarbons with bonded compounds or impurities of sulphur or nitrogen are referred to as 'impure', and remain somewhat erroneously referred to as hydrocarbons.

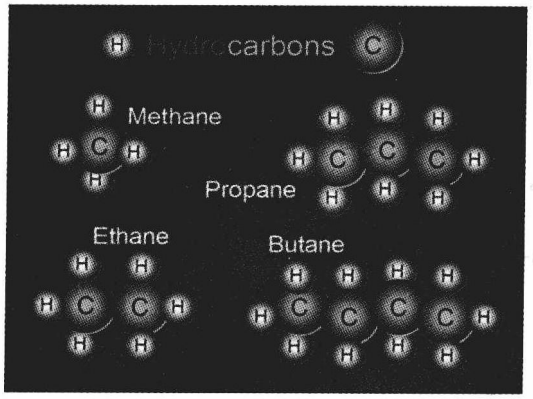

Fig. 2 Molecular images of some hydrocarbons

Hydrocarbons are referred to as consisting of a 'backbone' or 'skeleton' composed entirely of carbon and hydrogen and other bonded compounds, and lack a functional group that generally facilitates combustion without adverse effects. Shown in Fig. 2 are molecular images of some hydrocarbons, i. e. methane, ethane, propane and butane. The majority of hydrocarbons found naturally occur in crude oil, where decomposed organic matter provides an abundance of carbon and hydrogen which, when bonded can catenate to form seemingly limitless chains. Oil refineries are key to obtaining hydrocarbons, where crude oil is processed through several stages to form desirable hydrocarbons, used in fuel and other commercial products.

The following classifications for hydrocarbons defined by International Union of Pure and Applied Chemistry(IUPAC) nomenclature of organic chemistry are as follows:

1. Saturated hydrocarbons (alkanes) are the most simple of the hydrocarbon species and are composed entirely of single bonds and are saturated with hydrogen; they are the basis of petroleum fuels and are either found as linear or branched species of unlimited number. The general formula for saturated hydrocarbons is C_nH_{2n+2} (assuming non-cyclic structures).

2. Unsaturated hydrocarbons have one or more double or triple bonds between carbon atoms. Those with one double bond are called alkenes, with the formula C_nH_{2n} (assuming non-cyclic structures). Those containing triple bonds are called alkynes.

3. Cycloalkanes are hydrocarbons containing one or more carbon rings to which hydrogen atoms are attached. The general formula for a saturated hydrocarbon containing one ring is C_nH_{2n}.

4. Aromatic hydrocarbons, also known as arenes which have at least one aromatic ring.

Hydrocarbons can be gases (e. g. methane and propane), liquids (e. g. hexane and benzene), waxes or low melting solids (e. g. paraffin wax and naphthalene) or polymers (e. g. polyethylene, polypropylene and polystyrene).

Because of differences in molecular structure, the empirical formula remains different between hydrocarbons; in linear, or 'straight-run' alkanes, alkenes and alkynes, the amount of bonded hy-